

WHAT IS CLAIMED IS:

1. An optical system having a folded light path for generating electrical signals representing images contained on motion picture film, said folded light path comprising:

5 three segments, the first segment and the third segment being substantially parallel and the second segment being approximately orthogonal to said first and third segments,

a lamp included in said first segment,  
an aperture proximate said film located in said second segment,  
10 a photosensitive detector located in said third segment, and  
beam bending optics between said first and second segment and between said second and third segments.

2. An optical system having a folded light path for generating electrical signals representing images contained on motion picture film, said folded light path  
15 optical system comprising:

three segments respectively mounted on three different surfaces,  
a lamp is included in said first segment,  
an aperture proximate to said motion picture film located in said second  
segment, and  
20 a photosensitive detector located in said third segment.

3. The optical system of Claim 2, wherein said first and third surfaces containing the first and third segments are both angled with respect to the second surface containing the second segment.

4. The optical system of Claim 3 wherein, said first and third segments are  
25 substantially parallel, and the second segment is approximately orthogonal to said first and third segments.

5. The optical system of Claim 4 wherein, said first and third segments are physically attached to front and back sides of a single mounting frame.

6. The optical system of Claim 4 wherein, said second surface containing  
30 the second segment is provided by a film guide plate that is joined to said single mounting frame supporting said first and third segments.

7. The optical system of Claim 6 wherein, said film guide plate and said mounting frame comprise low thermal expansion material.

8. The optical system of Claim 7 wherein, said film guide plate and said mounting frame comprises invar.

5 9. The optical system of Claim 6 wherein, said photosensitive detector is mounted on a movable sensor plate mounted on said third surface.

10. The optical system of Claim 2 wherein, said first segment further includes a lens.

10 11. The optical system of Claim 2 wherein, said third segment further includes an lens.

12. The optical system of Claim 2, further comprising first and second reflecting surfaces mounted on said second surface positioned to reflect light emanating from said lamp through said second segment and into said third segment.

15 13. The optical system of Claim 12, wherein said first and second reflecting surfaces are angled approximately 45 degrees with respect to said second surface.

14. The optical system of Claim 12, wherein said first and second reflecting surfaces are provided by silver surfaces on front silvered mirrors.

15 15. A device for generating electrical signals representing images contained on motion picture film, said device comprising:

20 a surface proximate to said motion picture film, said surface having an aperture;

a photosensitive detector; and

25 an optical system having a folded light path comprising three segments, the first segment and the third segments being substantially parallel and the second segment being approximately orthogonal to said first and third segments,

wherein a lamp is included in said first segment, said aperture is located in said second segment, and said photosensitive detector is located in said third segment.

30 16. A device for generating electrical signals representing images contained on motion picture film, said device comprising:

a surface proximate to said motion picture film, said surface having an aperture;

a photosensitive detector; and

an optical system having a folded light path comprising three segments, respectively mounted on three different surfaces;

wherein a lamp is included in said first segment, said aperture is included in said second segment, and said photosensitive detector is included in said third segment.

17. A device for converting images recorded on film into an electronic format comprising:

a platform supporting film reels; and

a scanning module comprising an illuminating subassembly, a film guide subassembly, and an imaging subassembly;

said illumination subassembly including a lamp;

said film guide subassembly including a guide having an aperture over which said film passes, said aperture being illuminated by said illumination subassembly;

said imaging subassembly including a photosensitive detector that receives light that passes through said aperture and said film and outputs an electrical signal,

wherein said scanning module is separate from said platform.

18. The device of Claim 17, wherein said scanning module comprises low thermal expansion material.

19. The device of Claim 17, wherein said platform comprises a plate of material having a larger thermal expansion coefficient than said low thermal expansion material comprising said scanning module.

20. The device of Claim 18, wherein said scanning module comprises invar.

21. The device of Claim 17, further comprising a supply spool, a take-up spool, and film guide rollers mounted on said platform.

22. The device of Claim 17, further comprising film guide rollers mounted on said scanning module.

23. A device having a scanning module in which light producing components and a detector for converting an image recorded on a film into electronic data are substantially sealed in a region remote from said film, said device including:

5 a modular enclosure resealable against dust and against particulate matter from said film;

a first and second glass window in said enclosure resealable against dust and against particulate matter from said film;

a lamp housed within said modular enclosure;

10 a film guide mounted to an outside surface of said enclosure between said first and second windows, said film guide having an aperture therein; and

a photosensitive detector mounted within said enclosure at a location wherein light from said lamp passes through said aperture in said film guide and to said photosensitive detector.

15 24. The device of Claim 23, wherein said modular enclosure includes a resealable access port proximal to said lamp.

25. The device of Claim 23, wherein said modular enclosure comprises electrically conducting material.

26. The device of Claim 23, wherein said modular enclosure comprises thermally conducting material.

20 27. The device of Claim 23, wherein said electrically conducting material comprises material selected from the group consisting aluminum and aluminum alloys.

28. The device of Claim 23, wherein said first and second windows comprise removable windows.

25 29. A portable device for converting images recorded on film into an electronic format comprising a compact optical system having a folded light path that provides portability to said device, said folded light path optical system comprising:

three segments, the first segment and the third segments being substantially parallel and the second segment being approximately orthogonal to said first and third segments,

30 a lamp included in said first segment,

an aperture proximate said film located in said second segment,

a photosensitive detector located in said third segment, and  
beam bending optics between said first and second segment and between  
said second and third segments.

5 30. The device of Claim 29, further comprising a parallel processor  
electrically connected to said photosensitive detector.

31. The device of Claim 29, further comprising an optical detector  
positioned so as to receive light from said lamp that does not pass through said aperture.

32. The device of Claim 29, further comprising a heating element proximal  
to said lamp.

10 33. The device of Claim 29, further comprising  
a parallel processor electrically connected to said photosensitive detector;  
and  
an optical detector positioned so as to receive light from said lamp that  
does not pass through said aperture.

15 34. The device of Claim 29, further comprising  
a parallel processor electrically connected to said photosensitive detector;  
and  
a heating element proximal to said lamp.

20 35. The device of Claim 29, further comprising  
an optical detector positioned so as to receive light from said lamp that  
does not pass through said aperture; and  
a heating element proximal to said lamp.

36. A method of manufacturing a device for converting images recorded on  
film to an electronic format:

25 mounting a rotatable supply spool and a rotatable take-up spool on a  
platform with an opening;

constructing a scanning module including

(i) affixing a film guide plate comprising two holes to a  
mounting frame,

30 (ii) mounting a lamp and an optical detector on opposite sides  
of said mounting frame,

(iii) mounting a film guide having an aperture over which said film passes on said film guide plate,

(iv) positioning two mirrors proximal said each of said two holes in said film guide plate, and

5 (v) aligning said lamp, holes, mirrors, film guide, and detector such that light from said lamp passes through one of said holes, reflects from one of said mirrors, passes through said aperture in said film guide, reflects off said other mirror, through said other hole in said film guide plate, and onto said detector; and

10 inserting said scanning module into said opening of said platform.

37. The device of Claim 36, wherein said scanning module is manufactured to a more precise tolerance than said platform and said spools mounted thereon.

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